

**APPENDIX K – RESIDENTIAL WATER SURVEY PROGRAM
TECHNICAL MEMORANDUM**



City of Hanford

Technical Memorandum 1

RESIDENTIAL WATER SURVEY PROGRAM

DRAFT

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RESIDENTIAL WATER SURVEY PROGRAM

1.0 INTRODUCTION

The City of Hanford (City) is preparing to implement residential water surveys as a Demand Management Measure (DMM) outlined by the Urban Water Management Plan (UWMP) Guidelines. The goal of the Residential Water Survey Program (Program) is to reduce water waste and increase awareness to residential customers of the importance of water use efficiency. The following sections outline the recommended Program, including the survey protocol, data storage, instructions for performing the survey, methods for informing residents of surveys, estimating staff time, and analyzing the survey results.

2.0 SURVEY PROTOCOL

Implementing a Residential Water Survey includes several steps, such as setting Program goals, allocating resources to the Program, training staff to perform the surveys, and managing collected information. The following protocol has been developed to guide the City on implementing this Program.

2.1 Establish Survey Goals

Establishing goals, such as program duration, targeted number of customers, and water use reduction, is the first step in implementing the Program. Program goals can inform the City of the resources required to perform the surveys. The goals can also be used to evaluate the results of the Program.

The California Urban Water Conservation Council (CUWCC) has established residential water survey goals for its Memorandum of Understanding (MOU) signatories. The goals are to inform at least 20 percent of all Single-Family Residential (SFR) and Multi-Family Residential (MFR) customers of the availability of water surveys, and to perform surveys for at least 15 percent of SFR and MFR customers within ten years after signing the MOU. Since the City is not a signatory, these goals can be considered as guidelines, not requirements.

In the City's 2005 UWMP Addendum, the City established a goal of reaching the top one to five percent of high water use SFR customers in the first two years of the Program. To begin the Program, City staff indicates that two existing staff members will be made available to perform surveys on Friday afternoons, either every week or every other week. According to other agencies, it is common for these surveys to take approximately 1.5 hours including travel time. It is assumed that three of these surveys can be completed in one afternoon (total of 4.5 hours). If the survey staff were available every Friday for two years, the City could complete 312 surveys, or just over two percent of all metered and unmetered SFR customers (13,857 according to Chapter 3). Continuing the same schedule, the City could reach about 11 percent of SFR customers over ten years.

This appears to be a reasonable goal for the City to start its Program. After the first two years, the City could consider adding staff time to complete additional surveys, perhaps targeting MFR customers as well. After two years, the program can be evaluated for effectiveness and compared to other DMMs. The evaluation may show that water surveys are not as cost effective as other DMMs. However, for the purpose of this Program outline, it is assumed that the Program will last for a minimum of ten years.

Many factors can influence the number of customers that respond to an offer for an in-home survey. In order to complete 156 surveys each year, it is recommended that the City advertise to at least 600 high water-use customers each year.

The CUWCC estimates that 32.2 gpd can be saved for each completed water survey¹. Assuming 1,560 completed surveys over ten years, the total water saved using this estimate is approximately 50,232 gpd. Table 2.1 provides a summary of these recommended Program Goals.

Table 2.1 Summary of Program Goals	
Goal Name	Goal
Program Duration	10 years (with 2-year review)
Number of Customers to be Targeted	600 SFR Customers per year
Number of Surveys to be Completed	1,560 (156 per year) (11% of all SFR Customers)
Types of Customers	Highest SFR Water Users
Water Savings	50,232 gpd (32.2 gpd per Survey)
Notes: 1. Auto numbering is on for table notes. Restart this note numbering at 1 if this is a 2nd, 3rd, etc. table (click on the icon on the Carollo QAT). If the notes paragraphs do not hang correctly, select the notes	

2.2 Establish Survey Budget

The next step in implementing the Program is committing the resources required. Section 3.0 discusses the potential range of costs associated with implementing a Water Survey Program.

2.3 Develop Survey Materials

It is recommended that the City develop the following materials to complete each survey: Customer Behavior Questionnaire, Survey Checklist, Water Survey Advertisement, and a Water Use Efficiency Brochure. The City may either create these items in-house or adopt them from other agencies implementing water surveys.

¹ BMP Costs and Savings Study, A Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices, A & N Technical Services, March 2005, p. 2-48

2.3.1 Customer Behavior Questionnaire

The purpose of the Customer Behavior Questionnaire is to gain information on current water use behaviors, and to increase awareness of how those behaviors can change. The questionnaire is to be completed by the customer during the inspection. The following items are recommended to be included in this questionnaire:

1. Number of occupants in home.
2. Water use behaviors:
 - a. Change irrigation timer seasonally.
 - b. Average length of time to wait for hot water.
 - c. Frequency of outdoor washing (driveways, sidewalks, cars).
 - d. Laundry (full loads).
 - e. Dishwashing (full loads).
3. Awareness of the need for water conservation.
4. Awareness of methods to conserve.
5. Any specific techniques employed.

2.3.2 Survey Checklist

The survey checklist is intended to track the data collected at each survey, including the following:

1. Customer name, address, billing number, current average, and peak water use.
2. Results of Testing (e.g. existing toilet flush volume, faucet flow, etc.).
3. Devices given/installed.
4. Recommendations.
5. Estimated water savings for each improvement.

2.3.3 Water Survey Advertisement

To advertise the water surveys, developing a small brochure that can be inserted into monthly water bills is recommended. The same graphics and summary text used for the brochure can be used to post on the City's website.

2.3.4 Water Use Efficiency Brochure

Upon completion of each water survey, it is recommended that the City provide each customer with a Water Use Efficiency Brochure. The brochure should include tips on efficient water use behaviors and resources to get more information or assistance.

2.4 Surveyor Training

It is important that the staff members performing the surveys be trained to thoroughly perform each survey. It is common for two surveyors to perform each survey, focusing on the indoor and outdoor water use separately. It is recommended that the surveyors be trained in the following items:

1. Protocol for home visits.
2. Review Customer Behavior Questionnaire.
3. Review Inspection Checklist.
4. Indoor plumbing flow measurement.
5. Outdoor irrigation inspection (e.g. leak detection, catch-can measurements).
6. Calculating irrigation timer recommendations based on local evapotranspiration (ET) data and landscaping needs.
7. Familiarity with different irrigation controllers.
8. Meter check.
9. Review potential recommendations.
10. Protocol for supplying devices.
11. Installing devices.
12. Protocol for data logging.

The CUWCC maintains a list of consulting firms that provide training for water conservation coordinators and staff. One company that provides training specifically for residential water surveys is WaterWise Consulting, Inc. Training specifically for the outdoor water surveys is offered by Ewing Irrigation.

2.5 Purchase Equipment

The City should prepare an inventory of equipment needed to perform the surveys and devices to be given and/or installed. Ample supplies of the equipment should be brought to each survey location. These items should include the following:

1. Survey Equipment:
 - a. Stop-watch.
 - b. Flow-volume measurement bag.
 - c. Dye tablets.
 - d. Catch-can cups.

2. Devices to be Provided:

- a. Faucet Aerators.
- b. Showerheads.
- c. Hose Nozzles.
- d. Irrigation Timers.

2.6 Advertise Survey

Different methods of advertising to customers are discussed in Section 5.0 below. In order to target the highest water users for advertising water surveys, the City will need to review recent billing data. It is recommended that prior to each survey, the following data be collected and compiled on the “survey checklist” (see Section 2.3):

- Customer Name.
- Address.
- Billing Data.
- Current Water Use (Average and Peak).

2.7 Perform Surveys

Once the up-front work is complete, the City can begin performing surveys. Detailed instructions for what the surveys should include are discussed in Section 4.0.

2.8 Program Evaluation

It is important that the results of the surveys be properly tracked so that the program can be evaluated for cost-effectiveness. Methods for collecting data and evaluating the program are discussed in Sections 3.0 and 7.0, respectively.

3.0 COSTS AND STAFF TIME ESTIMATES

The costs for implementing residential water surveys vary greatly for different water agencies. For some agencies, a survey program is an extension of an already existing program to enforce outdoor water use regulations that does not require additional staffing. Other agencies contract out the work of performing surveys and collecting data.

As mentioned above, the City intends to start the Program using two existing staff members. Reallocating tasks so that existing staff are made available is a cost-effective way to perform the surveys. Assuming two staff members work 4.5 hours each Friday, it is anticipated that 468 hours of staff time is allocated for performing the surveys each year.

Other incremental amounts of staff time are anticipated to be needed for administering the Program. An additional two hours per week is estimated for taking customer calls, scheduling surveys, reviewing customer water use data (pre- and post-survey), and transferring collected data into a database. Including hours to perform the surveys, it is estimated that staff time will take approximately 572 staff hours each year.

Other costs for the Program include start-up, data collection, and program evaluation costs. Program start-up is anticipated to take several hours, including developing survey materials, inspector training, and equipment purchases. Maintaining a database of collected information and periodic program evaluation will take either additional staff time, or costs for hiring outside consultants to perform. Total estimated hours for program start-up are 68 hours.

Table 2.2 summarizes the estimated program costs. An hourly rate of \$75 was applied to the estimated hours to develop costs associated with existing staff time. As seen in the table, it is estimated that the program will cost the City an additional \$1,200 to get started and \$8,000 per year.

Table 3.1 Estimated Program Costs			
Item	Assumptions	One-Time Cost	Annual Cost
Develop Survey Materials	20 hours of existing staff time @ \$75/hr	\$1,500	
Survey Equipment	Estimated costs for <ul style="list-style-type: none"> • Dye Tablets • Irrigation Catchment Cups 	\$200	
Survey Devices	Estimated costs for <ul style="list-style-type: none"> • Faucet Aerators • Toilet Water Displacement Units • Hose Nozzles • Showerheads 		\$2,000
Inspector Training	4 hour training by outside agency, 2 staff members, 8 hours @ \$75/hr & payment for training	\$1,000	
Marketing	Brochures, website update, billing inserts 40 hours of existing staff time @ \$75/hr & Printing	\$3,000	\$1,000
Performing Surveys	468 hours of existing staff time @ \$75/hr		\$35,100
Admin & Data Collection	104 hours of existing staff time @ \$75/hr		\$7,800
Program Evaluation	\$10,000 every two years		\$5,000
TOTAL PROGRAM COST		\$5,700	\$50,900
ESTIMATED TOTAL ADDITIONAL COST TO CITY¹		\$1,200	\$8,000
Notes:			
1. Includes all costs except hours of existing staff members.			

4.0 ADVERTISING THE SURVEY

Several options exist for informing residents of the availability of surveys, including direct mail, newsletters, phone calls, billboard advertising, and through incentive programs. The effectiveness of each of these options varies for each City. Through interviews of several cities and water agencies performing residential water surveys, the most common method of advertisement is through billing inserts.

The most common driver for receiving requests for the surveys are in response to high water bills. Some agencies, such as Eastern Municipal Water District and Santa Clara Valley District, have expressed great success in customers requesting surveys as a result of an exceptionally high water bill. This is especially true for these agencies, which have tiered rate structures where the unit costs of water drastically increase with use. Additionally, agencies experience more requests during water shortages by customers facing fees for a water use violation. The City of Camarillo offered the option to have a survey performed in exchange for paying a violation fee.

It is recommended that the City inform residents of the new Water Survey Program through the following methods:

1. **Billing Insert:** Include a description of the program, including incentives and potential water savings. As discussed above, the recommended goal is to advertise to approximately 600 high-use SFR customers per year. Once the highest water users are identified, inserts should be included in their monthly bill.
2. **Website:** Add an advertisement to the City's website.
3. **Public Education & Outreach:** Be prepared to advertise the Program at all public education and outreach events, such as Water Awareness Week, and in all publications.

These methods should be fairly inexpensive and easy to implement using current staff. It is recommended that City staff track the responses to different types of advertising to judge the effectiveness. If the City is finding it difficult to get responses to the offer of a survey, additional methods include the following:

1. **Rebate Programs:** Consider starting rebate programs for low-flow toilets and/or high-efficient washing machines. Rebates can be offered after completion of a water survey.
2. **News Campaign:** Contact your local news media outlets for advertising.
3. **Billboards:** Pay to advertise on a prominent, local billboard.
4. **Water Rates:** The City could consider implementing a tiered water rate structure that promotes water use efficiency. Higher water rates will incentivize customers to evaluate their at-home water use behaviors and make changes appropriately.

5.0 INSTRUCTIONS FOR PERFORMING SURVEYS

The following instructions for performing surveys were developed from other agencies currently implementing residential water surveys. Prior to leaving for the site, the surveyors should have the customers name, address, billing number, and current water use data, along with all testing equipment and devices to be provided.

1. Provide customer with Questionnaire and instructions.
2. Turn off all water and check water meter for movement.
3. Indoor Inspections:
 - a. Add dye tablet to toilet tank.
 - b. Tests faucet flow rates.
 - c. Test showerhead flow rates.
 - d. Determine toilet flush volume.
 - e. Determine washing machine efficiency.
 - f. Determine dishwasher efficiency.
 - g. Check for indoor plumbing leaks: toilets, faucets, meters.
 - h. Document results in Surveyor Checklist.
4. Indoor Recommendations:
 - a. Offer/install a toilet water displacement device.
 - b. Offer/install faucet aerators.
 - c. Offer/install showerheads.
 - d. Provide other recommendations from results.
 - e. Provide Water Use Behavior Brochure.
 - f. Document devices given/installed in Surveyor Checklist.

5. Outdoor Inspections:
 - a. Check Irrigation System & Timer (maintenance and repairs). Due to liability concerns, it is recommended that the surveyors avoid touching the irrigation system valves or sprinklers.
 - b. Turn on each zone and check for leaks:
 - 1) Check meter for unusual volumes of water.
 - 2) Record set time for each zone.
 - c. Catch-can test to measure sprinkler output.
 - d. Calculate irrigation inches/hour.
 - e. Hose leaks at hose bibb and hose nozzle.
 - f. Optional: Estimate or measure landscape area.
 - g. Optional: Soil Probe to measure root depth and soil type.
 - h. Optional: Type of Grass/Turf.
 - i. Document results in Surveyor Checklist.
6. Outdoor Recommendations:
 - a. Develop specific irrigation schedule based on ET, irrigation system, and landscape conditions. Design for ensuring adequate water at the lowest-watered location discovered during the catch-can test.
 - b. Reset irrigation timer per recommendations.
 - c. Review recommended schedule with customer.
 - d. Provide information packet to customer.
 - e. Provide customer with evaluation results and recommendations.
7. Results & Recommendations:
 - a. Review results of survey with customer.
 - b. Provide Water Conservation Behavior Brochure.
8. Submit Surveyor Checklists for data logging.

6.0 DATA STORAGE

Properly tracking and organizing information collected during the surveys can greatly assist in performing periodic evaluations of the Program. This data is how the City tracks if the Program is meeting the established goals and how the program might be more effective.

6.1 Type of Data

The most important information for evaluating the effectiveness of the Program is the cost of performing and the water saved for each survey. Accounting for the costs of each survey can be accomplished by documenting the raw costs of performing the surveys, including staff hours, vehicle use, and the number of water-saving devices installed. Accounting for water saved can best be accomplished by documenting the pre- and post-survey average water use for customers that received a survey. Tracking pre- and post-survey water use should be done using the customers meter data. Average annual and peak water use for customers with completed surveys should be documented on an annual basis after completion of the survey.

Of secondary importance in tracking data is the information on current water fixtures and customer behaviors. In-house water surveys provide the City with a unique opportunity to build statistics on the efficiency of existing water fixtures and customer awareness of water use efficiency. This information can be used to identify other appropriate demand management measures, such as promoting installation of faucet aerators, or beginning a rebate program for high-efficiency washing machines.

As mentioned above, collecting and storing data may also be beneficial for evaluating specific advertisement methods. For example, after mailing out water bills with advertisements for the program, City staff could document the number of requests received within one week, two weeks, etc.

The following is a recommended list of data to be stored, in order of priority:

1. Water Conservation Metrics:
 - a. Pre-Survey Water Use: Annual Average and Peak Month.
 - b. Post-Survey Water Use: Annual Average and Peak Month.
2. Cost of Implementing Surveys:
 - a. Actual staff time.
 - b. Vehicle expense.
 - c. Number of devices given out.
 - d. Cost per device.

3. Survey Results:
 - a. Results of Customer Behavior Questionnaire (answers to each question).
 - b. Results of Indoor Plumbing Inspection (e.g. number of leaks, flush volume of toilets).
 - c. Results of Outdoor Irrigation Inspection (e.g. frequency of overwatering).
4. Survey Advertising:
 - a. Advertisement method.
 - b. Number of surveys requested.

6.2 Method of Storage

Data should be stored in a spreadsheet format for easy statistical analysis. Questions on the Customer Behavior Questionnaire should be asked such that answers can be numerical and compared to other answers. For example, the question “how many times per month do you run the washing machine without a full load?” results in numerical answers.

7.0 ANALYZING COSTS & WATER SAVINGS

Data collected before, during, and after the water surveys can be used to evaluate the effectiveness of the Program. It is recommended that a cost-benefit analysis of the Program be performed every two years to ensure that the Program is still cost-effective for the City. As discussed above, the most critical data to evaluate the Program is the cost of performing the surveys and the resulting reduction in water use. The pre- and post-survey water consumption of customers that received surveys should be compared to customers that did not receive surveys to account for any system-wide trends. Given the results of the evaluation, the City can opt to continue with the current Program, evaluate areas of potential improvement, or replace the Program with a more cost-effective DMM.